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(54) **ANTENNA COIL**

(57)Abstract:
PROBLEM TO BE SOLVED: To reduce an occupied area by miniaturization and to prevent a receiving sensitivity from being lowered by a difference in the install positions of an antenna coil.
SOLUTION: A first coil 5 and a second coil 6 are wound around a winding frame part 3 of a ferrite core 2 so that respective winding axes to be orthogonal, and a third coil 12 is wound around the outer peripheral parts of the first coil 5 and the second coil 6 so as to have a winding axis orthogonal to the winding axes of the first coil 5 and the second coil 6.

CLAIMS

[Claim(s)]
[Claim 1]The antenna coil characterized by carrying out the coil of the 1st coil and 2nd coil to the winding frame section of a core so that each volume shaft may intersect perpendicularly.
[Claim 2]The antenna coil according to claim 1 characterized by having arranged the 3rd coil which carried out the coil so that said the 1st coil and 2nd coil might be surrounded and a volume shaft might intersect perpendicularly to said two coils.
[Claim 3]Said 3rd coil is an antenna coil according to claim 2 characterized by carrying out the coil to the winding frame which has insulation.
[Claim 4]Said each coil is an antenna coil given in any 1 term of claim 1 characterized by having adjusted the number of coils so that the field strength or magnetic field strength by which induction is carried out to each coil may become almost equal thru/or claim 3.
[Claim 5]The base which is making the shape of a flat column, and the 1st coil wound so that X shaft orientations of said base might serve as a shaft, It has the 2nd coil wound so that Y shaft orientations of said base might serve as a shaft, and the 3rd coil wound so that Z shaft orientations of said base might serve as a shaft. Each **** which winds said 1st, 2nd, and 3rd coils is an antenna coil characterized by considering as the slot at least in a part.

[Claim 6]Said base prepares ear-shaped part material for the shape of a flat abbreviation rectangular parallelepiped in nothing and eight angles of the base of said rectangular parallelepiped. The 1st flank of said ear-shaped part material is arranged to the sense used as the side attachment wall of the 1st slot wound around said 1st coil. The 2nd flank of said ear-shaped part material is arranged to the sense used as the side attachment wall of the 2nd slot wound around said 2nd coil. The antenna coil according to claim 5 characterized by the thing to which the pinched part serves as a side attachment wall of the 3rd slot around which said 3rd coil is wound, and which was done for sense arrangement.

[Claim 7]The flat-surface configuration of said ear-shaped part material is an antenna coil according to claim 6 characterized by being formed in the flabellate form by the circle of a quadrant.
[Claim 8]An antenna coil given in claim 1 characterized by having connected any one of the ends in said each coil to the common terminal, respectively, having connected the three remaining ends to a different terminal, and making four terminals have thru/or any 1 term of 7.
[Claim 9]The antenna coil according to claim 8 characterized by connecting the end side end of a volume of said 1st coil, the start side end of a volume of said 2nd coil, and the start side end of a volume of said 3rd coil to said common terminal.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The field of the invention to which invention belongs]This invention relates to the small antenna coil which uses locking and unlocking of the door of an automobile for the keyless entry system for opening and closing by wireless actuation, the receiver of crime prevention equipment, etc.

[0002]

[Description of the Prior Art]Conventionally, the bar antenna coil with which the antenna coil used for this kind of keyless entry system, the receiver of crime prevention equipment, etc. gave the coil in accordance with the major axis of a rod-like ferrite core was used abundantly.

[0003]Namely, it has the directivity from which receiving sensibility becomes max to the electric wave which carries out incidence from the direction where the above bar antenna coils of structure are parallel to the major axis of a ferrite core, and receiving sensibility serves as min to the electric wave which carries out incidence from a direction vertical to the direction of a major axis of a ferrite core, and receiving sensibility falls extremely depending on the installation direction of this bar antenna coil. For this reason, using independently has few these bar antenna coils, and he is trying to raise the receiving sensibility as the whole antenna coil by making two or more bar antenna coils meet the X-axis and the Y-axis of the circuit board of a receiving set, and usually arranging them.

[0004]

[Problem(s) to be Solved by the Invention]However, since the occupancy area of the antenna coil part in said circuit board will become large, and the device itself which installs an antenna coil must be enlarged, it moves [if two or more bar antenna coils are made to meet the X-axis and the Y-axis of the circuit board of a receiving set and are arranged in this way,] against the miniaturization of a device. Moreover, the receiving sensibility which each bar antenna coil interferes mutually and is expected may not be obtained.

[0005]This invention tended to solve the trouble with which the above conventional antenna coils are equipped, it was made, and the object is offering the antenna coil which can attain small lightweight-ization. Moreover, other objects have interference in offering the antenna coil which can obtain little good receiving sensibility.

[0006]

[Means for Solving the Problem]This invention provides [1st] the winding frame section of a core with the antenna coil characterized by carrying out the coil of the 1st coil and 2nd coil so that each volume shaft may intersect perpendicularly in order to solve the above-mentioned technical problem. Moreover, the 2nd of this invention is characterized by having arranged the 3rd coil which carried out the coil so that said the 1st coil and 2nd coil might be surrounded and a volume shaft might intersect perpendicularly to said two coils. The 3rd of this invention is characterized by carrying out the coil of said 3rd coil to the winding frame which has insulation in said 2nd invention. The 4th of this invention is characterized by each coil in said the 1st thru/or 3rd invention having adjusted each number of coils so that the field strength or magnetic field strength by which induction is carried out to each coil may become almost equal. Furthermore, the antenna coil concerning the 5th of this inventionThe base which is making the shape of a flat column, and the 1st coil wound so that X shaft orientations of said base might serve as a shaft, It has the 2nd coil wound so that Y shaft orientations of said base might serve as a shaft, and the 3rd coil wound so that Z shaft orientations of said base might serve as a shaft, and each **** which winds said 1st, 2nd, and 3rd coils is characterized by considering as the slot at least in a part. In the antenna coil concerning the 6th of this invention, said baseEar-shaped part material is prepared for the shape of a flat abbreviation rectangular parallelepiped in nothing and base 8 angle of said rectangular parallelepiped. The 1st flank of said ear-shaped part material is arranged to the sense used as the side attachment wall of the 1st slot wound around said 1st coil. The 2nd flank of said ear-shaped part material is arranged to the sense used as the side attachment wall of the 2nd slot wound around said 2nd coil, and it is characterized by the thing to which the pinched part serves as a side attachment wall of the 3rd slot around which said 3rd coil is wound and which was done for sense arrangement. In the antenna coil concerning the 7th of this invention, the flat-surface configuration of said ear-shaped part material is characterized by being formed in the flabellate form by the circle of a

quadrant. In the antenna coil concerning the 8th of this invention, any one of the ends in said each coil is connected to a common terminal, respectively, the three remaining ends are connected to a different terminal, and it is characterized by making four terminals have. In the antenna coil concerning the 9th of this invention, it is characterized by connecting the end side end of a volume of said 1st coil, the start side end of a volume of said 2nd coil, and the start side end of a volume of said 3rd coil to said common terminal.

[0007]
[Embodiment of the Invention]Hereafter, the gestalt of operation of this invention is explained using an example. The perspective view showing the configuration of the ferrite core which used for the top view of drawing 4 the perspective view showing an example of the configuration of the ferrite core which uses for the top view of said antenna coil the perspective view in which drawing 1 shows the 1st embodiment of the antenna coil of this invention, and drawing 2, and uses drawing 3 for said antenna coil, the perspective view in which drawing 4 shows Mr. 2nd operation Kuma of the antenna coil of this invention, and drawing 5, and used drawing 6 for drawing 4 and drawing 5, the perspective view in which drawing 7 shows the 3rd embodiment of the antenna coil of this invention, and drawing 8 are the decomposition perspective views of the embodiment of drawing 7. In addition, in each drawing, the same sign is given to the same component and the overlapping explanation is omitted. Moreover, the X-axis in the following explanation, a Y-axis, and the Z-axis are shafts of a rectangular coordinate system, respectively.
[0008]In drawing 1 thru/or drawing 3, 1 shows a small antenna coil, from the four corners of the angle template-like coil section 3 and said coil section 3, projects and is formed. The ferrite core 2 which formed in one the lobes 4a, 4b, 4c, and 4d which served as the stopper of a coil, and the installation section of an electrode, It consists of the 2nd coil 6 which carried out the coil to two sides which everything but the coil section 3 counters so that the 1st coil 5 and roller which carried out the coil to two sides which the coil section 3 counters so that a roller may become the X-axis of a ferrite core 2 and parallel may become the Y-axis of this ferrite core 2, and parallel. If it puts in another way, the roller of the 1st coil 5 and the roller of the 2nd coil 6 will lie at right angles on the level surface. Moreover, it is made to have connected at the circuit board to which electronic equipment does not illustrate each cut-water edge of the 1st coil 5 and the 2nd coil 6, and each volume end edge through the polar zone 7 formed with the metal terminal assembly or solder attached in the lobes 4a, 4b, 4c, and 4d of a ferrite core 2, respectively.
[0009]The 2nd embodiment shown in drawing 4 and drawing 5 shows the example at the time of forming the configuration of a ferrite core 2 in the shape of a cross, the coil of the 1st coil 5 is carried out to the part 3-1 which extends in X shaft orientations of the coil section 3, it winds and the end edge is connected to the cut-water edge and the polar zone 7 formed in Lobes 4e and 4g, respectively. Moreover, in the part 3-2 which extends in Y shaft orientations of the coil section 3, the coil of the 2nd coil 6 is carried out, it winds and the end edge is connected to the cut-water edge and the polar zone 7 formed in Lobes 4f and 4h, respectively.
[0010]As for drawing 7 and drawing 8, said two embodiments show the 3rd different embodiment, 8 is the winding frame formed by insulating resin etc., the hole or the crevice 9 is formed in the center section, and the flanges 11a and 11b jutted out over parallel are formed in 4 rounds of the upper and lower sides of a wall 10. 12 is the 3rd coil by which the coil was carried out to the periphery of the wall 10 of a winding frame 8 so that a roller might become zeta shaft and parallel. And in the hole of a winding frame 8, or the crevice 9, the same 1st antenna coil section 13 as the embodiment shown by drawing 1 is arranged horizontally. Namely, the ferrite core 2 which formed in one the lobes 4a, 4b, 4c, and 4d from which the 1st antenna coil section 13 serves as the angle template-like coil section and a stopper of a coil, It consists of the 1st coil 5

which carried out the coil to two sides which the coil section of a ferrite core 2 counters so that a roller may become the X-axis and parallel, and the 2nd coil 6 which carried out the coil to two sides which everything but said coil section counters so that a roller may become a Y-axis and parallel. Moreover, it winds and the end edge is connected to the electrode 7 which was rolled and was arranged each cut-water edge of the 1st coil 5 of the 1st antenna coil section 13, and the 2nd coil 6, an end edge and the cut-water edge of the 3rd coil 12 which forms the 2nd antenna coil, and the side of the flanges 11a and 11b of a winding frame 8 where it counters, respectively. Therefore, it means that the 3rd coil 12 which forms the 2nd antenna coil section is arranged so that the 1st antenna coil section 13 may be surrounded through the wall 10 of a winding frame 8, and it was arranged so that a volume shaft might intersect perpendicularly to said the 1st coil 5 and 2nd coil 6.

[0011]In the 2nd operation gestalt shown by the 1st operation gestalt shown by drawing 1 and drawing 2 and drawing 4, and drawing 5The number of coils of each coil is adjusted so that the field strength by which induction is carried out to each of the 1st coil 5 and the 2nd coil 6 may become almost equal. Moreover, the 1st coil 5 and 2nd coil 6 form the tuning circuit way which became independent, respectively. When each tuning circuit is connected to a RF amplifying circuit and this RF amplifying circuit amplifies selectively the strong one of the output signal of each tuning circuit, Since the field strength or magnetic field strength by which induction is carried out to the 1st coil 5 from X shaft orientations of an antenna coil 1 to the electric wave which carries out incidence becomes strong, the harmonic ringing of the 1st coil 5 side tuning circuit is amplified in a RF amplifying circuit. Moreover, since the field strength or magnetic field strength by which induction is carried out to a coil 6 from Y shaft orientations of an antenna coil 1 to the electric wave which carries out incidence becomes strong, the harmonic ringing of the tuning circuit by the side of the 2nd coil 6 will be amplified in a RF amplifying circuit. Thus, with two operation gestalten shown by drawing 1, drawing 2 and drawing 4, and drawing 5, receiving sensibility can be made good to the electric wave of a direction level to the field which the X-axis and the Y-axis of an antenna coil 1 form.

[0012]Moreover, it sets in the 3rd operation gestalt shown by drawing 7 and drawing 8. So that the field strength or magnetic field strength by which induction is carried out to each of the 3rd coil 12 which forms like the above the 1st coil 5, 2nd coil 6, and 2nd antenna coil section which form the 1st antenna coil section 13 may become almost equalThe tuning circuit where the number of coils of each coil is adjusted, and the 1st coil 5, the 2nd coil 6, and the 3rd coil 12 became independent, respectively is formed. When each tuning circuit is connected to a RF amplifying circuit and this RF amplifying circuit amplifies selectively the strong one of the output signal of each tuning circuit, this RF amplifying circuitThe output signal of the tuning circuit which the 1st coil 5 forms from X shaft orientations to the electric wave which carries out incidence is amplified selectively. The output signal of the tuning circuit which the 3rd coil 12 forms to the electric wave which amplifies selectively the output signal of the tuning circuit which the 2nd coil 6 forms from Y shaft orientations to the electric wave which carries out incidence, and carries out incidence from zeta shaft orientations is amplified selectively. **(ing), with this operation gestalt, an antenna coil 1 makes receiving sensibility good also to the electric wave which carries out incidence from zeta shaft orientations which intersect perpendicularly to said level surface in addition to a direction level to the field which the X-axis and a Y-axis form.

[0013]The antenna coil applied to the 4th operation gestalt at drawing 9 thru/or drawing 11 is shown. In this antenna coil, it has composition which wound the 1st coil 5, the 2nd coil 6, and the 3rd coil 12 around the base 20 which is making the shape of a flat column. The 1st coil 5 is wound so that X shaft orientations of a base may serve as a shaft, the 2nd coil 6 is wound so that Y shaft orientations of a base may serve as a shaft, and the 3rd coil 12 is wound so that

Z shaft orientations of a base may serve as a shaft. The base 20 is constituted by the ferrite.

[0014]The ear-shaped part material 21 is formed in eight angles of the base 20 which makes nothing and a rectangular parallelepiped in the shape of an abbreviation rectangular parallelepiped with a flat base 20. The flat-surface configuration of the above-mentioned ear-shaped part material 21 is formed in the flabellate form by the circle of a quadrant. The 2nd deepest slot 22 is formed in X shaft orientations when installing a base 20 in the front face of a base 20 at a flat condition, and the 2nd coil 6 is wound around this 2nd slot 22. 2nd flank 21b of the ear-shaped part material 21 is arranged at the sense used as the side attachment wall of the 2nd slot 22.

[0015]The 1st slot 23 is formed in Y shaft orientations when installing a base 20 in the front face of a base 20 at a flat condition, and the 1st coil 5 is wound around this 1st slot 23. 1st flank 21a of the ear-shaped part material 21 is arranged at the sense used as the side attachment wall of the 1st slot 23. The base of two ear-shaped part material 21 arranged so that the flat-surface section may counter mutually is the 3rd slot 24, partial 21c sandwiched by the flat surface of the ear-shaped part material 21 becomes the side attachment wall of the slot 24 of h3 around which the 3rd coil 12 is wound, and sense arrangement of it is carried out.

[0016]To the base 20 constituted as mentioned above, the 2nd coil 6 is wound and the 1st coil 5 is wound in the direction which is the top next and intersects perpendicularly, and it is wound so that the 3rd coil 12 may meet a peripheral surface. The antenna coil of this condition is set to the case 30 made of resin as shown in drawing 11.

[0017]A case 30 has the flat configuration which placed the square pole flatly in general, for example, drilled the disc-like hole from the top face. The above-mentioned hole is the magnitude which can install the antenna coil shown in drawing 10. Moreover, the side-face center section cuts and lacks in two pairs of the side face in the flat square pole which counters. It is laid under the four corners in the flat square pole so that a terminals [which were prepared in tabular with the rear face of a case 30 / 31a-31d] end side may project, and the other end side is stuck on the side face of a case 30.

[0018]The lid 32 made of resin is stuck on four exposed ear-shaped part material 21 in the condition (in drawing 11, although the coil is not wound, wound actually) of having arranged the base 20 where the 1st coil 5, 2nd coil 6, and 3rd coil 12 were wound to the hole of the above-mentioned case 30. The tabular terminal 33 it is [the flat-surface configuration of a lid 32] almost the same as that of the ear-shaped part material 21 it, and flat is formed.

[0019]To one predetermined terminal 33, tuck up any 1 of the ends in the 1st coil 5, 2nd coil 6, and 3rd coil 12, respectively, and it is twisted. As opposed to the three remaining terminals 33, respectively The remaining end of the 1st coil 5, The remaining end in the 2nd remaining end and 3rd remaining coil 12 of a coil 6 is matched, and is tucked up and twisted around 1 to 1, the end of a coil, each terminal 32, and corresponding terminals [31a-31d] lobe is soldered, and electric connection is obtained. Soldering mounting of the rear face which cannot view the case 30 in drawing 11 is carried out at the circuit board, and let the field which can be viewed be a top face.

[0020]The example of a configuration of the receiving circuit constituted using the antenna coil concerning the 3rd and 4th operation gestalt concerning this invention is shown in drawing 12 and drawing 13. Let "F" of the start side end of a volume of a coil, and a suffix be the end side end of a volume of a coil for "S" of a suffix (subscript) in subsequent explanation. First, the example of a configuration of drawing 12 is explained. The end side end XF of a volume of the 2nd coil 6 Start side end YS of a volume of the 1st coil 5 Start side end ZS of a volume of the 3rd coil 12 It connects with a common terminal COM and is the start side end XS of a volume of the 2nd coil 6. The end side end YF of a volume of the 1st coil 5 The end side end ZF of a volume of the 3rd coil 12 Each is connected to the terminal according to individual. The common terminal COM is grounded.

[0021]Amplifier 41a-41c is formed, and one side of the input edge of Amplifier 41a-41c is grounded. The non-grounded side input edge in amplifier 41a is the start side end XS of a volume of the 2nd coil 6. It connects. The non-grounded side input edge in amplifier 41b is the end side end YF of a volume of the 1st coil 5. It connects. The non-grounded side input edge in amplifier 41c is the end side end ZF of a volume of the 3rd coil 12. It connects.
[0022]Capacitor C is connected, respectively between each earth side input edge of Amplifier 41a-41c, and each non-grounded side input edge. Each outgoing end of Amplifier 41a-41c is connected to the receiving selection means 42, such as radio equipment. The receiving selection means 42 chooses the biggest signal of the signals outputted from each outgoing end of Amplifier 41a-41c.
[0023]Also in the 4th operation gestalt, the tuning circuit where the number of coils of each coil is adjusted, and the 1st coil 5, the 2nd coil 6, and the 3rd coil 12 became independent, respectively is formed, each tuning circuit is connected to a RF amplifying circuit (amplifier 41a-41c), and this RF amplifying circuit amplifies and carries out alternative [of the strong one of the output signal of each tuning circuit]. The above-mentioned RF amplifying circuit makes magnification selection of the output signal of the tuning circuit which the 3rd coil 12 forms to the electric wave which makes magnification selection of the output signal of the tuning circuit which the 2nd coil 6 forms to the electric wave which makes magnification selection of the output signal of the tuning circuit which the 1st coil 5 forms from X shaft orientations to the electric wave which carries out incidence, and carries out incidence from Y shaft orientations, and carries out incidence from zeta shaft orientations. It ** and an antenna coil can make receiving sensibility good also in this 4th operation gestalt also to the electric wave which carries out incidence from the X-axis, a Y-axis, and zeta shaft orientations.
[0024]Next, the example of a configuration of drawing 13 is explained. Although Capacitor C is connected to drawing 12 in the example of a configuration, respectively between each earth side input edge of Amplifier 41a-41c, and each non-grounded side input edge, in the example of a configuration of drawing 13, Capacitor C is connected to the 2nd coil 6 at juxtaposition, Capacitor C is connected to the 1st coil 5 at juxtaposition, and Capacitor C is connected to the 3rd coil 12 at juxtaposition.
[0025]Common connection of one input edge of each of Amplifier 41a-41c is made, it is grounded, and it is the end side end XF of a volume of the 2nd coil 6. Start side end YS of a volume of the 1st coil 5 Start side end ZS of a volume of the 3rd coil 12 It connects with a common terminal COM and this is connected to the common connection terminal of the above-mentioned amplifier 41a-41c. By this configuration as well as the configuration of drawing 12, an antenna coil can make receiving sensibility good from the X-axis, a Y-axis, and zeta shaft orientations selectively to the electric wave which carries out incidence.

[0026]As above-mentioned drawing 12 and drawing 13 were shown, the end of each coil is connected to an antenna coil side at a common terminal COM. In this case, at the example in above-mentioned drawing 12 and drawing 13, it is the end side end XF of a volume of the 2nd coil 6. Start side end YS of a volume of the 1st coil 5 Start side end ZS of a volume of the 3rd coil 12 It connected with the common terminal COM. As an end which can connect with a common terminal, it sets in the 2nd coil 6 and is End XF. It sets in End XS and the 1st coil 5, and is End YF. It sets in End YS and the 3rd coil 12, and is End ZF. End ZS It is. It is End XF as shown in drawing 12 and drawing 13. End YS and end ZS When it is written as FSS with SAFIKKU about the selected example, the number of those associations which combine which three ends is 23 = 8.
[0027]When the eight above-mentioned kinds are described with a suffix, they are SSS, FFF, FFS, FSF, FSS, SFF, SFS, and SSF. It is End XF as the trial of any of these eight kinds of inside serve as a suitable receiving sensibility property was indicated to be **** b to drawing 12 and drawing 13 by measuring frequency

characteristics at the time. End YS End ZS FSS which is the selected example was the most suitable.

[0028]That is, when the frequency characteristics over the electric wave which carries out incidence to left-hand side from X shaft orientations are shown, the frequency characteristics over the electric wave which carries out incidence in the center from Y shaft orientations are shown and the frequency characteristics over the electric wave which carries out incidence to right-hand side from zeta shaft orientations are shown, as shown at drawing 14 in the case of FSS, it turns out that the impedance value in the resonance frequency which is the peak part of a graph is most highly stable, and it has the almost same frequency characteristics also to which shaft orientations, and receiving sensibility becomes good. In addition, in each chart, an axis of ordinate is an impedance, 1 graduation is 50Kohm, an axis of abscissa is a frequency and the core of an axis of abscissa is [the width of face of 134.2kHz and an axis of abscissa] 30kHz. In addition, the thickness of the thickest part in which, as for the thickness of 9 millimeters and the thinnest part, the diameter of 400 turns and a base 2 contains 0.9 millimeters and the ear-shaped part material 21 in the number of turns of each coil set capacity of 2.8 millimeters and Capacitor C to 200pF.

[0029]As opposed to the above, as shown at drawing 15 in FFS, there is dispersion in resonance frequency and an impedance value to X shaft orientations, Y shaft orientations, and Z shaft orientations, and moreover to X shaft orientations and Z shaft orientations, unsuitable properties, such as crushing of the peak part produced by interfering with other coils, are seen. Also in the example of the common connection of those other than FFS except FSS, it is the same as that of FFS almost, and the property which was equal to 3 shaft orientations being difficult to get, and unsuitable frequency characteristics were seen.

[0030]Although the above explanation showed the example which formed the ear-shaped part material 21 to the base 20, the bobbin 50 fundamentally shown in drawing 16 can be used. That is, this bobbin 50 has the base 51 which is making the shape of a flat column, the 1st slot 52 prepared in order to wind the 1st coil so that X shaft orientations of a base 51 may serve as a shaft, and the 2nd slot 53 prepared in order to wind the 3rd coil so that Z shaft orientations of a base 51 may serve as a shaft. Four cylindrical members 54 prolonged in the shape of a long picture toward Y shaft orientations of a base 51 are formed along with four sides of a base 51. The 2nd coil is wound so that this cylindrical member 54 may be crossed. That is, the 2nd coil is wound so that the direction of a roller may serve as a Y-axis. In this drawing 16, the 1st, 2nd, and 3rd coils are not illustrated. The same effectiveness as the antenna coil applied to the 4th operation gestalt also with the antenna coil of a configuration of starting can be acquired. Furthermore, the ferrite core 2 in each above-mentioned embodiment may be changed into the core made of resin, and construction material can use not only a ferrite but resin etc. also about bases 20 and 51.

[0031]

[Effect of the Invention]according to the antenna coil applied to this invention as explained above -- the X-axis Y shaft orientations of one core or base -- or, since the coil is wound around an X-axis Y-axis and Z shaft orientationsSince the receiving sensibility to the electric wave which carries out incidence from three directions which intersect perpendicularly can choose that of a good peach while being able to do small compared with the case where gather and two or more bar antenna coils are used as an antenna coil, it is possible to make receiving sensibility suitable irrespective of the installation location of an antenna coil. Furthermore, it is possible to make common connection of every [of the terminal of three coils / 1 / any], and to make receiving sensibility good.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]The perspective view showing the 1st embodiment of the antenna coil of this invention.
[Drawing 2]The top view of the 1st embodiment of the antenna coil of this invention.
[Drawing 3]The perspective view showing an example of the configuration of the ferrite core used for the antenna coil concerning the 1st embodiment of this invention.
[Drawing 4]The perspective view showing the 2nd embodiment of the antenna coil of this invention.
[Drawing 5]The top view of the 2nd embodiment of the antenna coil of this invention.
[Drawing 6]The perspective view showing an example of the configuration of the ferrite core used for the 2nd embodiment of the antenna coil of this invention.

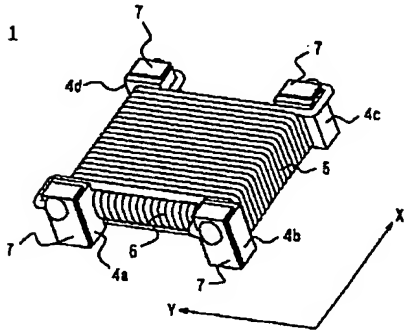
[Drawing 7]The perspective view of the 3rd embodiment of the antenna coil of this invention.
[Drawing 8]The perspective view of the 3rd embodiment of the antenna coil of this invention.
[Drawing 9]The perspective view showing the base of the antenna coil concerning the 4th operation gestalt.
[Drawing 10]The perspective view showing the base where the coil in the antenna coil concerning the 4th operation gestalt was wound.
[Drawing 11]The perspective view showing the condition that the base where the coil in the antenna coil concerning the 4th operation gestalt was wound was set to the case.
[Drawing 12]The block diagram of the receiving circuit constituted using the antenna coil concerning the 4th operation gestalt.
[Drawing 13]The block diagram of the receiving circuit constituted using the antenna coil concerning the 4th operation gestalt.
[Drawing 14]Drawing showing the frequency characteristics when making connection which becomes the best in the antenna coil concerning the 4th operation gestalt when common connection of the one predetermined end in each coil is made.

[Drawing 15]Drawing showing the frequency characteristics when making connection other than the connection which becomes the best in the antenna coil concerning the 4th operation gestalt when common connection of the one predetermined end in each coil is made.
[Drawing 16]The perspective view showing the base of the antenna coil concerning the 5th operation gestalt.
[Description of Notations]
1 Antenna Coil
2 Ferrite Core
3 Coil Section
4a-4h Lobe
5 1st Coil
6 2nd Coil
7 Polar Zone
8 Winding Frame
9 Hole (or Crevice)
10 Wall
11a, 11b Flange
12 3rd Coil
13 1st Antenna Coil Section
20 Base
21 Ear-shaped Part Material
22 2nd Slot

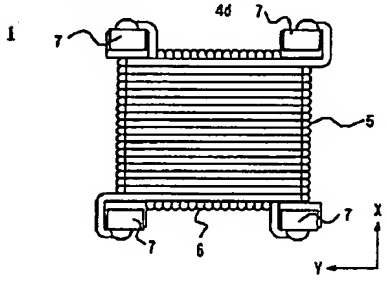
23 1st Slot
24 3rd Slot
30 Case
31a-31d Terminal
32 Lid
33 Terminal
41a-41c Amplifier
42 Receiving Means
50 Bobbin
51 Base
52 1st Slot
53 2nd Slot
54 Cylindrical Member

DRAWINGS

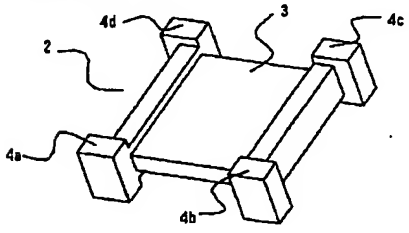
[Drawing 1]



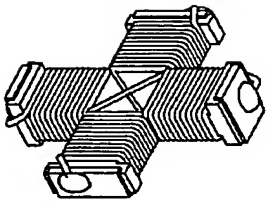
[Drawing 2]



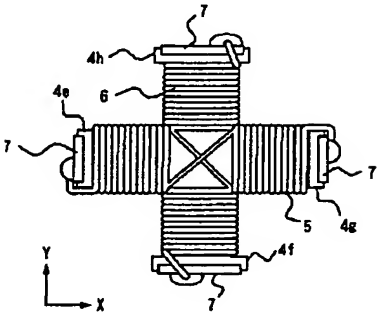
[Drawing 3]



[Drawing 4]



[Drawing 5]



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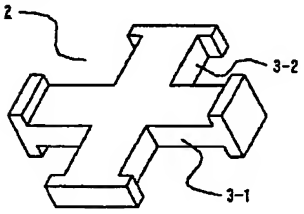

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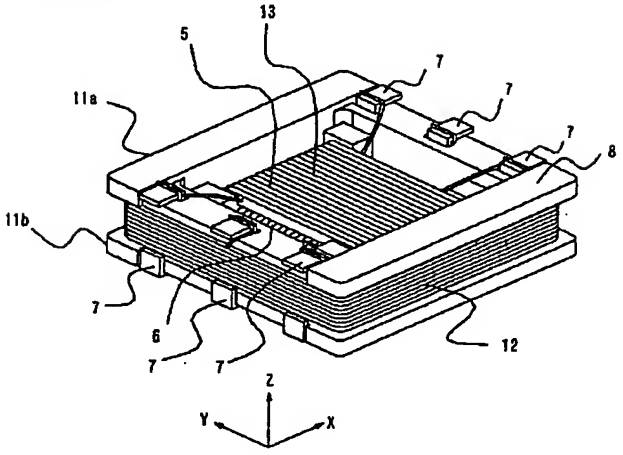

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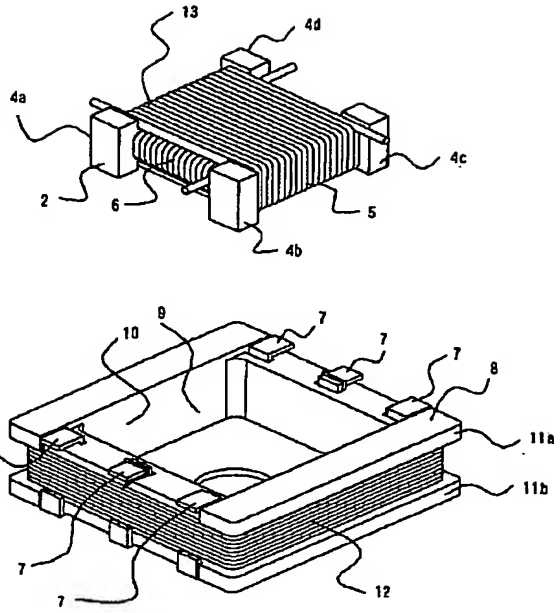

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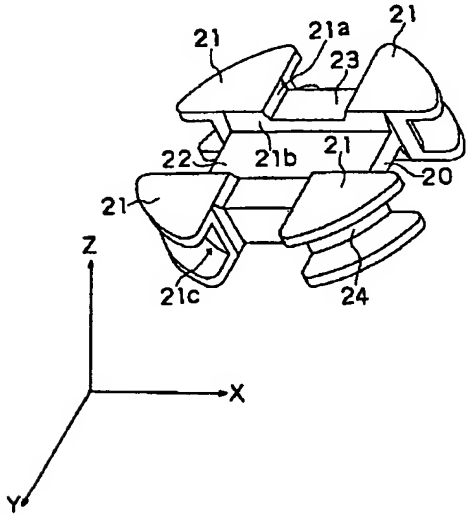

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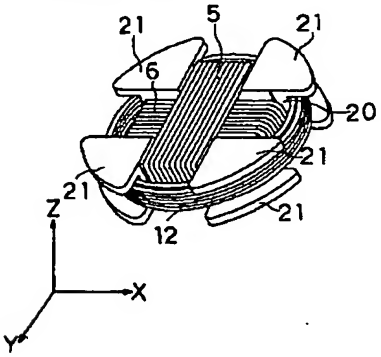

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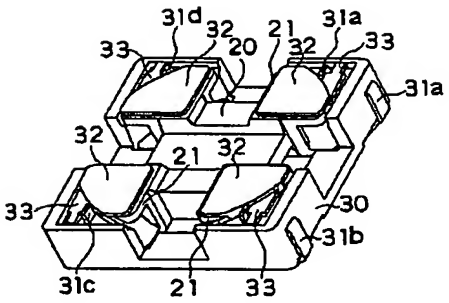

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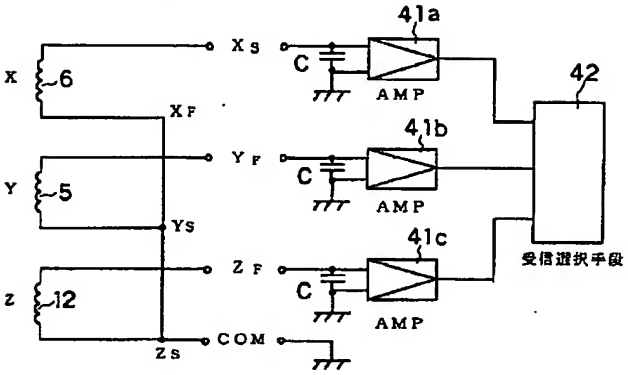

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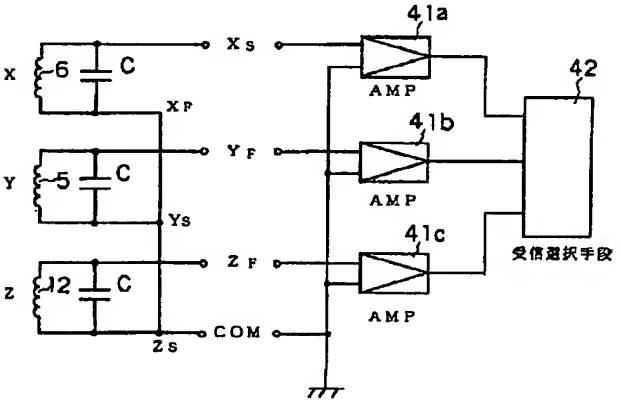

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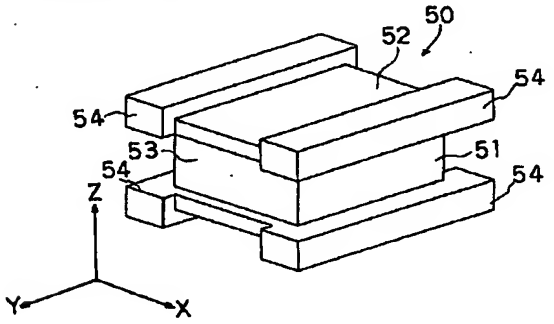
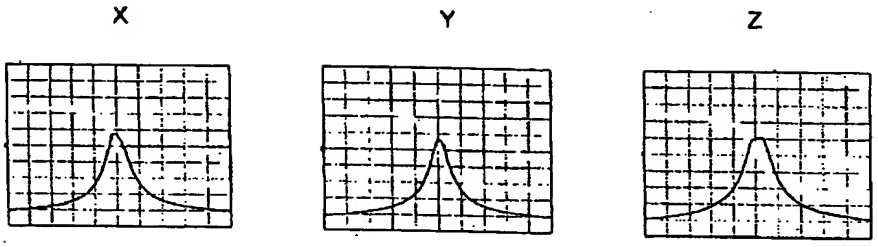


[Drawing 14]



[Drawing 15]